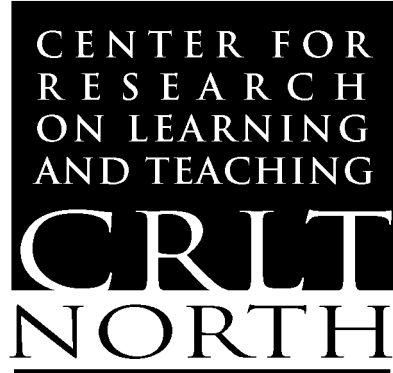


University of Michigan



CRLT NORTH
Report for College of Engineering
2004-2005

4117 Engineering Research Building I
2200 Bonisteel Blvd
Ann Arbor, MI 48109-2099

Phone: 734-763-960
Fax: 734-764-5339
Email: crltnorth@umich.edu
Website: <http://www.engin.umich.edu/teaching/crltnorth/>

CRLT North
Report for College of Engineering
June 1, 2004-May 31, 2005

During the 2004-2005 academic year, CRLT and CRLT North provided a number of services for the College of Engineering. This report provides a summary of those services and is separated into several sections as follows:

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Report Overview

The Center for Research on Learning and Teaching (CRLT) has more than a 40 year history of partnering with faculty at the University of Michigan to enhance student learning across campus. In January 2004, CRLT collaborated with the College of Engineering (CoE) to establish CRLT North, a new office on North Campus to better serve the engineering community. CRLT North's Engineering Programs are coordinated by an experienced engineering educator in close collaboration with CoE faculty and administrators. This new partnership exemplifies CoE's commitment to achieving excellence in engineering education, one of the highest priority goals identified by the recent CoE strategic planning process. Many of the CRLT North Engineering Programs have proved to be especially useful in realizing the CoE's goal. Some of those programs include:

- ✓ Consultations with instructors to evaluate and improve all aspects of a student's education
- ✓ Customized services to help departments balance and integrate various components of the engineering curriculum
- ✓ Special programs to help faculty and graduate student instructors (GSIs) match educational technologies and teaching methods to learning objectives

Statistical Summary of CRLT North Services

CRLT North

One of CRLT's main goals for the 2003-2004 academic year was hiring a full-time engineering educator to lead initiatives in improving engineering education and faculty development efforts in the CoE. Dr. Cynthia J. Finelli was jointly hired by the CoE and CRLT to fill this role, and she assumed full-time employment as Managing Director of CRLT North on July 14, 2003. Effective September 1, 2004, this appointment was changed to 80% and Dr. Finelli was officially appointed as Associate Research Scientist in Undergraduate Engineering Education at a 20% level. Dr. Finelli is assisted in her efforts by several professional staff members from CRLT, including Drs. Matthew Kaplan, Vilma Mesa, Chris O'Neal, May Piontek, Erping Zhu, and by Program Assistant, Natalie Taliaferro.

CRLT North Office

CRLT North, a branch office of CRLT, was opened and has been in operation on North Campus since January 2004. The office is located on the fourth floor (4117) of the Engineering Research Building I, next to the Gerstacker Building and across from the Lurie Engineering Center. Establishing CRLT North involved coordinating renovations for the office suite. Furniture for the conference room adjacent to CRLT North (the ETA conference room) was ordered, delivered, and installed in August 2004. In addition, coordination has taken place with the Facilities Coordinator for Engineering Administration to explore the possibility of building a wall in the open bay of 4112 to allow the Program Assistant for engineering to work regularly from North Campus. Natalie Taliaferro was hired by CRLT in May 2005 to serve as the primary engineering Program Assistant.

Publicity and Outreach

To publicize CRLT North and describe the activities offered through the new office, several efforts were undertaken. The first issue of the CRLT North newsletter, *CRLT North News*, was completed in October 2004 and was distributed to the mailboxes of all engineering faculty and GSIs. The second issue for Winter 2005 went out on February 2005. Also, www.engin.umich.edu/teaching/crltnorth, a Web site for CRLT North created in January 2004, now includes an up-to-date list of the CRLT workshops and a link to register for them, information about Engineering Graduate Student Mentors and Engineering GSI Teacher Training, and several links to pages at the CRLT web site. According to the CoE Web site statistics, there were page reviews at the CRLT North Web site through the end of the academic year. These hits included access to the workshop registration page, links to the CRLT North survey site, and other visits. The CRLT North report for engineering, a comprehensive report detailing CRLT North's activities during 2003-2004 for the College of Engineering, was completed in August 2004. The report was distributed to the following individuals: the Dean's Cabinet, members of the Engineering Teaching Academy, Engineering Department Chairs, the Undergraduate Management Team, the Strategic Planning Implementation – Education Committee, and the Engineering Graduate Student Mentors.

Engineering Teaching Academy (ETA) Subgroup for CRLT North

A subgroup of the Engineering Teaching Academy (ETA) was created in December 2003 to provide guidance and advice in planning activities for CRLT North. The ETA/CRLT North subgroup met approximately once per month during the 2004-2005 academic year. The group talked about general keys to success (especially ensuring that activities are engineering specific and highly visible), programming for CRLT North, strategies for getting higher participation at CRLT North events, and assisted in plans for the year. The ETA also identified “Effective and Efficient Teaching: Building on Fundamentals” as the theme for 2005-2006.

Members of the ETA/CRLT North subgroup include:

- Scott Fogler, *Professor of Chemical Engineering*
- James Holloway, *Associate Professor of Nuclear and Radio Science Engineering*
- J. Wayne Jones, *Professor of Materials Science and Engineering*
- Tresa Pollock, *Professor of Materials Science and Engineering*
- Kenneth Powell, *Professor of Aerospace Engineering*
- Alan Wineman, *Professor of Mechanical Engineering*

College-Wide Services

Seminar Series for Engineering

During the Fall 2004 and Winter 2005 terms, CRLT North offered engineering-focused seminars and programs for faculty and GSIs. These programs brought instructors together to share ideas across disciplines, develop and improve their teaching skills, expand their repertoire of teaching methods, and gain new perspectives on teaching in the CoE. The following sessions were offered:

- ✓ *Efficient, Effective Teaching*. 10/12/04. 34 participants.
- ✓ *Using Groups Effectively in Engineering and Science Courses: A CRLT Theatre Performance*. 10/27/04. 13 participants.
- ✓ *GSI, Student, and Researcher: Balancing your Roles*. 10/28/04. 16 participants.
- ✓ *Effective Lecturing in Engineering and Science*. 11/01/04. 10 Participants.
- ✓ *Faculty Talk about Effective Teaching*. 11/11/04. 24 Participants.
- ✓ *Using Personal Response Systems to Promote Active Learning in Large Classes*. 02/03/05. 16 Participants.
- ✓ *Teaching Problem-Solving for GSIs*. 02/17/05. 15 Participants.
- ✓ *Engaging Students in Engineering Education: Lessons from Research* (3-part series): (1) *Peer Instruction*. 02/23/05. 7 Participants.; (2) *Active Learning*. 01/25/05. 12 Participants.; (3) *Effective Student Teams*. 02/10/05. 11 Participants.

- ✓ *Conversations about Refining your Teaching* (3-part series): (1) *One-on-One Teaching*. 01/19/05. 17 Participants.; (2) *Lecturing*. 01/27/05. 20 Participants.; (3) *Nontechnological Alternatives to Lecturing*. 02/08/05. 16 Participants.
- ✓ *Best Practices in Writing Effective Tests for Engineering*. 03/09/05. 16 Participants.

Consultations

CRLT North professional staff provides individual consultation services to faculty, GSIs, administrators, and staff. Topics for consultations include: curricular and instructional matters such as course design, integrating innovative approaches to teaching and learning, interpretation of student ratings, finding ways to improve teaching and learning in a class or increasing demand for evaluation services, CRLT North provides assistance and expertise to help individuals conceptualize, develop, and carry out evaluations related to educational innovation and to assist in all phases of grant design, including planning, implementing, analyzing, and disseminating evaluation research.

During the 2004-2005 academic year, CRLT North staff held 62 consultations with individuals about issues related to teaching and learning and 11 consultations about research projects or proposal preparation. These consultations served individuals from various departments, programs, and committees, including:

Academic Support Services; Aerospace Engineering; Biomedical Engineering; Center for Professional Development Civil and Environmental Engineering; Chemical Engineering; College of Engineering Faculty Committee; College of Engineering Honor Council; Electrical Engineering and Computer Science; Humanities; Industrial and Operations Engineering; International Programs; Materials Science Engineering; Mechanical Engineering; Minority Engineering Program Office; Naval Architecture and Marine Engineering; School of Art and Design; School of Information; Sociology; Student Leadership and Academic Services; Technical Communications; Undergraduate Engineering Education; and Women in Science and Engineering.

CRLT Players Theatre Troupe

The CRLT Players theatre troupe is comprised of local professionals and student actors, who enact performances to explore pedagogical practices, enhance teaching and learning, and support diversity at the University of Michigan. The program is primarily funded by the Office of the Provost, the CoE, and LSA. The CRLT Players perform stimulating, interactive sketches based on scripts that reflect research on the experiences of students in the classroom, especially students of color and women in the sciences and engineering. Following the presentation of a scenario, the audience members dialogue with the characters about the issues raised. A trained facilitator guides this discussion and provides research-based information relevant to the particular performance. Then, the CRLT Players perform a revised scenario in which the characters utilize different methods that allow all students to learn more

effectively. This use of theatre has a powerful impact on instructors, helping them to gain insights and ideas for improving classroom practices.

For the CoE, the CRLT Players performed the ADVANCE Faculty Meeting sketch (depicting the potential influence of faculty gender and rank on conversations during an important faculty meeting), the Gender in the Classroom sketch (exemplifying the “chilly” climate that women students may encounter in science and engineering classrooms), and the new ADVANCE Mentoring sketch (showing issues pertaining to responsibilities of both mentors and mentees in establishing and sustaining successful mentoring relationships). Audiences for the performance included CoE graduate students, GSIs, faculty, department chairs, students in the graduate course ENG 580: Teaching Engineering, the Biomedical Engineering Department, and the Network of Women Scientists and Engineers. The following performances were offered:

- ✓ Gender in the Classroom. XX/XX/XX. XX participants.
- ✓ ADVANCE Faculty Meeting. XX/XX/XX. XX participants.
- ✓ ADVANCE Faculty Meeting. XX/XX/XX. XX participants.
- ✓ Gender in the Classroom. XX/XX/XX. XX participants.
- ✓ ADVANCE Faculty Meeting. XX/XX/XX. XX participants.
- ✓ ADVANCE Faculty Meeting. XX/XX/XX. XX participants.
- ✓ Gender in the Classroom. XX/XX/XX. XX participants.
- ✓ Mentoring Graduate Students. XX/XX/XX. XX participants.
- ✓ Gender in the Classroom. XX/XX/XX. XX participants.
- ✓ Preview of ADVANCE Mentoring. XX/XX/XX. XX participants.

Services for CoE Administrators, Departments, and Staff

CRLT North delivered several specialized services to engineering administrators, departments, and staff. These services consisted of individual consultations, presentations, department-specific initiatives, and service on college committees.

Consultations with Deans

The staff of CRLT North, including Constance Cook, Cynthia Finelli, and Vilma Mesa, met regularly with the Associate and Assistant Deans of the CoE to consult about faculty development, teaching-related issues, and GSI training.

Presentations

To provide further guidance for the CoE, CRLT North staff often present information at department and staff meetings and in individual classrooms. During the academic year, CRLT North staff made such presentations for XX faculty of the Electrical Engineering and Computer Science Department, XX faculty of the Chemical Engineering Department, XX faculty of the Undergraduate Management Team, and twice for XX students in the graduate course ENG 580: Teaching Engineering.

Committee Service

During the 2004-2005 academic year, the Managing Director served on the following CoE committees:

- Strategic Planning Implementation – Education Committee
- College of Engineering Outreach Team
- CRLT North/ETA Subgroup
- Engineering Teaching Academy
- Diversity and Outreach Council

Programs for CoE Faculty

New Faculty Orientation

In conjunction with the Provost and Executive Vice President for Academic Affairs, CRLT organized and facilitated the campus-wide New Faculty Orientation on 8/31/05. XX engineering faculty participated in the program. In addition, the Managing Director of CRLT North assisted the Associate Dean of Academic Affairs in planning the Keys to the College session (orientation for new faculty in the CoE), where she delivered an interactive discussion on research on the best practices in higher education. XX new faculty participated in the program.

Midterm Student Feedbacks for Individual Instructors

CRLT North collects student feedback for individuals who wish to assess and improve their teaching during the term. A CRLT North consultant observes the class and then confers with the students about what is going well and what changes would improve the students' learning. The consultant later meets with the instructor to report findings and discuss strategies for change. During the 2004-2005 academic year, CRLT North staff conducted 18 midterm student feedback sessions for faculty in the CoE.

Programs for CoE Graduate Student Instructors

Engineering GSI Teaching Training

Staff from CRLT North organized and facilitated teaching orientation programs for new CoE GSIs in Fall 2004 and Winter 2005. During the Fall 2004, 133 engineering GSIs participated in the session on 9/11/04; 72 engineering GSIs attended the Winter 2005 program on 01/08/05. Attendees at orientation received training in the fundamentals of effective teaching, as well as in teaching labs, handling office hours, and utilizing effective multicultural teaching. The orientations also featured two required practice teaching sessions for every GSI. Evaluations of orientations were positive (Average

rating on the question “I have a better understanding of my role and responsibilities as a GSI” was 4.1/5.0 in fall and 4.1/5.0 in winter.

Engineering Graduate Student Mentors Program

CRLT North trained and managed the Engineering Graduate Student Mentors (EGSMs) group during both terms of the 2004-2005 academic year. Through this program, ten experienced GSIs were recruited by CRLT North to each mentor 20-30 other GSIs. CRLT North conducted mid-semester review meetings for each EGSM, and the GSIs also evaluated the mentors every term. Evaluations continue to be stellar, and the EGSMs continue to be extremely effective at offering individualized, professional development to CoE GSIs. The EGSM group met every other week during the term with almost 100% attendance.

In Fall 2004, the EGSMs served 281 GSIs, and in Winter 2005, the EGSMs served 207 GSIs. The following table presents the number of GSIs who participated in various activities for each term.

Term (Total services provided)	Fall 2004 (506)	Winter 2005 (436)
E-mail consultations	222	159
Resource e-mails	96	79
Midterm Student Feedbacks or observations	42	35
Scheduled consultations on teaching	50	50
Other face-to-face consultations	95	112
Planned events by the GSIs	1	1

Support for American Society for Engineering Education

The University of Michigan Chapter of the American Society for Engineering Education (ASEE) is an organization committed to furthering education in engineering. It offers programs designed to prepare interested graduate students for careers in academia, provide undergraduate students with a better understanding of graduate education, and support the increased involvement of under-represented minority groups in higher education. During the 2004-2005 academic year, CRLT North staff provided support for the ASEE student chapter in the following ways:

- Attended two sessions of the 2004 Summer Seminar Series to provide feedback about presentation style. 08/05/04 and 08/12/04.
- Met with executive officers of the group to discuss ways to coordinate ASEE and CRLT North plans for Fall 2004. 08/02/04.

Online Midterm Student Ratings

Collaborations between the Engineering Teaching Academy, the Undergraduate Student Advisory Board, and the College of Engineering webmaster have occurred during the 2004-2005 academic year to explore an online midterm student ratings of teaching survey. The content of the survey has already been designed and the team is currently addressing the logical aspects of the online survey. The project should be ready to be administered in Fall 2005.

Preparing Future Faculty Events

In collaboration with the Horace H. Rackham School of Graduate Studies, CRLT offered the sixth annual Rackham-CRLT Seminar on College Teaching: Preparing Future Faculty in May 2005, with funding provided by the Provost's Office and Rackham. The seminar covered information about preparing for the academic job search and about higher education, as well as discussions on effective and reflective teaching. Fifteen CoE graduate students were admitted to the seminar. The seminar was very highly rated and considered an invaluable experience by its participants.

In addition, a one-day Preparing Future Faculty seminar, Getting Ready for an Academic Career, was offered for the University of Michigan community on 10/6/04. This seminar was designed to help graduate students and postdoctoral scholars prepare for the transition to faculty jobs, and it featured sessions about what it means to pursue an academic career, how to prepare for the job search process, faculty work life and expectations at different types of colleges and universities, compiling a teaching portfolio and developing a curriculum vitae for the job market. A total of 43 graduate students from the CoE participated in the session.

Research

Academic Integrity

A research team, called the PACES Team, made up of Trevor Harding at Kettering University, Donald Carpenter at Lawrence Technological University, and Cindy Finelli at the University of Michigan has dedicatedly worked during the 2003-2004 academic year creating, developing, and perfecting various research projects believed to better the education of engineering students. Throughout the year, the team has conducted many teleconference meetings as well as monthly face-to-face meetings to further the project.

The PACES 2 Study involved developing a model of the student decision-making process so as to identify factors that influence students' decision to cheat or not to cheat. Because research has indicated that (1) engineering students self-report cheating at higher rates than in most other disciplines and (2) students in humanities self-report cheating at some of the lowest rates, we are comparing the model for engineering students with that for humanities students. The team also studied the effects of year in college on the model. As a result, a survey to test the model was designed and administered.

The research team conducted a pilot test at U-M of the PACES 2 survey coupled with the DIT-2 survey during two separate sessions in October 2004. The project used 30 randomly-selected first-year humanities students, 30 first-year engineering students, 30 senior humanities students, and 30 senior engineering students from U-M. A total of 14 students participated in the study, and the data was used to refine the protocol for survey administration as well as the survey itself.

In order to confirm the temporal stability of the survey, the team conducted a test-retest of the PACES 2 survey at U-M in November 2004. 300 Randomly-selected engineering juniors were invited. A total of 75 students participated in the “test” and 58 participated in the “retest.” The data was used to refine the survey for full administration in early January. The research team conducted full-scale testing of the survey at U-M, Lawrence Technological University, and Kettering University in January 2005. In total, 1200 students were invited to complete the one-hour survey (and earn \$20 for doing so), and 349 valid surveys were returned. Preliminary analysis of the data has also been conducted.

The team submitted the proposal “Collaborative research: Development and dissemination of a predictive model of academic dishonesty in engineering undergraduates” on July 9, 2004. Although the proposal was not funded, reviews were extremely positive. The proposal was actually the highest rated of 50 proposals and NSF was very enthusiastic about the project.

Evaluating Methods for Improving Teaching in the College of Engineering

During the Winter 2005 academic term, 28 faculty at the College of Engineering at U-M participated in a research project to evaluate methods for improving teaching. The project was designed and conducted by instructional consultants from the Center for Research on Learning and Teaching (CRLT) North at the request of the Associate Dean for Undergraduate Education. Faculty were randomly assigned to one of four separate cohorts, each completing a different method for improving teaching, and comparative data was collected on each of the four methods. Faculty in *Cohort 0: Control* served as the control population and did not complete a formal method for improving teaching. In *Cohort 2: Feedback and Consult*, an instructional consultant facilitated a student feedback session at midterm and then conducted a follow-up consultation with the faculty member. An instructional consultant videotaped a class period for faculty in *Cohort 3: Videotape and Consult* and had a follow-up consultation.

To compare the four methods for improving teaching, data from three separate sources was analyzed. First, student ratings of teaching were collected in the middle of the academic term and again at the end of the term. The ratings were studied and the change in average ratings from midterm to end of term was compared to assess the level of teaching improvement. Second, all faculty completed an online survey to assess the method of improving teaching they completed, to rate their own teaching at the end of the term, and to describe their perceptions of the project. Faculty responses were analyzed

and compared by cohort. Finally, a focus group for the instructional consultants was conducted to gauge their perceptions of each method, to ascertain the nature of the consultations, and to identify kinds of issues that arose in each consultation.

CRLT North Staff

Cynthia Finelli, *Managing Director of CRLT North*

Cynthia Finelli holds a joint appointment in the CoE and CRLT. She earned a B.S.E.E., an M.S.E.E., and Ph.D. from the University of Michigan. She returned to U-M after ten years at Kettering University. While at Kettering, she was the Richard L. Terrell Professor of Excellence in Teaching, founding director of the Center for Excellence in Teaching and Learning, and associate professor of electrical engineering. She is a strong advocate of active, team-based learning in the classroom, and she received Kettering University's highest teaching award in 1997. At Kettering, she co-chaired both the Curriculum Reform Task Force and the Faculty Gender Equity Task Force, and she served on the university-wide Strategic Planning Task Force. At CRLT North, Cynthia is actively engaged in two engineering education research projects: one to identify and validate concrete approaches for reducing the frequency of cheating and the second, to design a simple, reliable, and valid instrument for peer evaluation of teamwork.

Vilma Mesa, *Instructional Consultant*

Vilma Mesa holds a B.S. in computer science and a B.S. in mathematics from the University of Los Andes, in Bogotá, Columbia. She also holds an M.A. and a Ph.D. in mathematics education from the University of Georgia. At the University of Los Andes, she taught undergraduate mathematics courses and participated in an initiative to incorporate technology into pre-calculus courses. Prior to joining CRLT in January 2003, Vilma was a research fellow and lecturer in the University of Michigan's School of Education where she conducted research on middle school mathematics teachers' professional development, algebra teachers' use of curriculum materials, and coordinated the master's of curriculum development program. As an instructional consultant, Vilma specializes in mathematics and engineering teaching.

Chris O'Neal, *Instructional Consultant*

Chris O'Neal earned his Ph.D in biology from the University of Michigan. Chris has been with CRLT since 1999 and is currently the team leader for the Center's sciences, technology, engineering, and math team. Chris focuses on science instruction and has contributed to the design and development of campus-wide workshops on active learning, problem-solving skills, and engaging students. In his customized services to various departments, Chris has addressed issues such as curriculum revision, the scholarship of teaching and learning, clinical instruction, and implementation of team-based learning. Chris is also a co-coordinator of the Rackham-CRLT Seminar on College Teaching: Preparing Future Faculty.

Mary Piontek, *Evaluation Researcher*

Mary Piontek earned a B.A. and M.A. in English Literature and a Ph.D. in measurement, research, and evaluation from Western Michigan University. She has considerable experience doing evaluation research in educational settings and has consulted with foundations, school districts, institutions of higher education, and organizations on program evaluation and educational research issues. In her current role, Mary works with individual faculty members, schools, and departments that need assistance assessing the effectiveness of initiatives to improve teaching and learning. She is the co-author of *Evaluation Strategies for Communicating and Reporting: Enhancing Learning in Organizations* (Sage, 1996).

Erping Zhu, *Instructional Technology Specialist and Instructional Consultant*

Erping Zhu earned a Ph.D in instructional systems technology from Indiana University. Prior to coming to CRLT, Erping was an instructional designer at Florida Gulf Coast University. She consults with faculty about integrating technology into their teaching and developing courses that incorporate instructional technology. Erping also collaborates with colleagues from the University of Michigan technology units to provide services and programs to faculty, such as the Teaching with Technology Institute and Enriching Scholarship Program. She co-authored a chapter, "Teaching and Technology," for W. McKeachie's *Teaching Tips* (Houghton Mifflin, 2002) and a monograph entitled "Technology and Teaching: Characteristics and Implications of an Integrated Approach" (Global Learning Center, U-M Business School, 2001).

Natalie Taliaferro, *Seminar Series Coordinator and Program Assistant*

Natalie Taliaferro earned her B.A. in Spanish from the University of Michigan in May 2005. Shortly after graduation, Natalie joined the CRLT team as an event planner, coordinating a series of campus-wide seminars and roundtable discussions for faculty, staff, and graduate students. Natalie also has a joint appointment in the CoE. She works closely with the Managing Director of CRLT North in organizing the multiple workshops and seminars specifically geared towards engineering faculty and GSIs.